A flight and new distribution record of *Antitrogus carnei* Britton (Coleoptera: Scarabaeidae: Melolonthinae)

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Abstract
The rare beetle *Antitrogus carnei* Britton (Scarabaeidae: Melolonthinae: Melolonthini) known from Canberra, ACT, and Yea, Victoria, is here recorded from a third locality, Laverton North Grassland Reserve, Victoria. Observations of a late afternoon flight are reported. The biology of the species is compared to that of other *Antitrogus* species. (*The Victorian Naturalist* **126** (6) 2009, 207–210)

Keywords: *Antitrogus carnei*, canegrub, Melolonthini, Laverton North, grassland

Introduction

Antitrogus Burmeister is an endemic Australian genus of large chafer beetles that includes some better-studied pests of sugarcane and pastures, and some rarely collected species, such as *A. carnei* Britton (Fig. 1), about which very little is known. Twenty-three species of *Antitrogus* have been described, of which six are recorded from Victoria (Allsopp 2003). *Antitrogus carnei* is one of the smallest, 16-18 mm long, with a black head, pronotum and scutellum and strongly contrasting red-brown elytra (Britton 1978; Allsopp 2003). Published biological data on *A. carnei* were first provided by Britton (1978) as part of the species description. Allsopp (2003) reviewed the genus but gave no additional details.

The holotype male was reared by PB Carne of the CSIRO Division of Entomology from larvae collected at Westridge (the original name for Yarralumla), Canberra, ACT, by P Rothery on 3 December 1948, as was the single known female. Additional specimens noted by Britton were all from Canberra except for four males (*ex* the collection of Queensland coleopterist JG Brooks) collected on 8 January 1971 at Yea, Victoria. The other Canberra material consisted entirely of adult males: six additional specimens bred from the larvae collected by Rothery in 1948; adults collected in May 1949 and 13 February 1957; an adult bred from a larva collected in a lawn at Campbell on 17 December 1968; and an adult collected flying low over lawns at dusk on 5 December 1972. All specimens mentioned were in the Australian National Insect Collection (Britton 1978).

Adult Melolonthini have a 'brief life span' and many species have a 'brief flight period', so 'the acquisition of study material [is] very much a matter of chance' (Britton 1978 p. 3) and much of their biology remains to be discovered. Known life cycles in *Antitrogus* occupy one or two years (Allsopp 2003). Larvae live in the soil where they feed on the roots of grasses and other plants (Allsopp 2003). Adults are attracted to lights but reportedly fly only for a brief period (c. 0.5 hr) at dusk on a few days in the year (Britton 1978). Flights mainly occur during spring and summer after rain, and the adults do not feed (Allsopp 2003). Adult *Antitrogus* females fly rarely, disperse poorly, are not attracted to lights and are much rarer in collections than males (Allsopp 2003).

Antitrogus species display strong sexual dimorphism in the size and shape of the antennae (Britton 1978) and the densities of antennal sensilla (Allsopp 1990), with females having small antennae and reduced numbers of sensilla. Males are believed to use their superior odour detection capabilities to locate the more sedentary females by orienting on female pheromones (Allsopp 1990) as occurs with the closely related *Rhopaea magnicornis* Blackburn (Soo Hoo and Roberts 1965). Females therefore have little need to fly and, in some species, may not fully emerge from the soil. Female *A. parvulus* Burmeister, 'seem to just poke their abdomens out of the ground, mate and then go back down to lay their one batch of eggs' (Allsopp pers. comm. 10 February 2009). Allsopp (pers. comm.) has noted that females of that species

Fig. 1. *Antitrogus carnei* male from Laverton North Grassland (image by Ken Walker, Museum Victoria, courtesy of http://www.padil.gov.au).

'seem to turn off any pheromone very quickly' and that he has never seen more than one or two males at each female.

These behaviours and lifecycles of *Antitrogus* species combine to make them 'more vulnerable to localised extinction' than similar large Melolonthini (Allsopp 2003 p. 175). Successive generations tend to occur in the same patches (Logan 1997), the populations have little mobility, and the whole adult population may be simultaneously vulnerable to locally catastrophic events.

Observations

Adult *A. carnei* were observed on a single occasion in the south-western corner of the Laverton North Grassland Reserve, Altona North, 15 km west of Melbourne, Victoria (37°51'S, 144°48'E), on 25 November 2007. The Reserve is a remnant Basalt Plains Grassland dominated by Kangaroo Grass *Themeda triandra* with subdominant grasses including Wallaby Grasses *Austrodanthonia* spp., the Spear Grass *Austrostipa bigeniculata* and the exotic Chilean Needle-grass *Nassella neesiana*. The soils are basaltic clays and clay loams that crack deeply when dry, and surface basalt rocks were once abundant (Craigie 1993). The area was first temporarily reserved in 1983 and has a complex history including a long period of livestock grazing before 1978 and management by fire (Craigie 1993; Lunt and Morgan 1999). The area in which the observations were made had been deliberately burnt on 6 April 2007 and carried little plant biomass.

The first adult was observed in flight, low over the grassland at 6:06 pm summer time and another at 6:07 pm, in sunny, cool conditions well before sunset. Four were seen flying simultaneously at 6:09 pm and numbers then continued to increase gradually, with flying individuals continually present. The beetles flew rapidly and continuously in erratic sweeping curves at heights mostly below 0.5 m, i.e. not far above the sparse grassland canopy. Suspecting that females would be present, the ground was repeatedly searched without success. No flying adults were seen to land. At the peak of the flight, scores of beetles must have been participating. Flight activity continued at least to 7:03 pm, when observations ceased. Local time of sunset was approximately 8:15 pm. The flight of *A. carnei* occurred over an area of at least 2 ha, extending from the edge of Kororoit Creek Road northwards for c. 150 m and east from the corner of Burns Road. No flight activity was observed in rank, unmanaged grassland on privately owned land traversed by an oxygen pipeline immediately to the west of the Reserve. Two flying males were collected by sweep net (6:06 pm and 6:15 pm). Other males were netted and released. Flying females were not detected. One of the specimens was kept alive until 2:00 pm on 27 November and failed to produce any excreta.

When the site next was visited, on 29 November 2007, there was no afternoon or dusk flight and no *A. carnei* were seen from 4:00 pm to 8:45 pm (summer time). Despite the recent abundance of adults none was found in deliberate ground searches. Instead there was a mass dusk flight of *Sericesthis harti* (Sharp) (Melolonthinae: Scitalini). Repeated ground searches associated with botanical studies on 4, 5, 6, 10 and 18 December failed to reveal any *A. carnei* or their skeletal remains and no flight activity was observed.

No rain was recorded at RAAF Williams airbase, Laverton (3.2 km to the SW of the collection locality) on 24 and 25 November, but

16.6 mm fell on 21 November, 11.6 mm on 22 November and 0.8 mm on 23 November (Bureau of Meteorology 2007). Recordings at that station on 25 November include 15.8°C and relative humidity (RH) of 74% at 9:00 am, 18.2° and RH of 61% at 3:00 pm, a daily minimum of 14.6°, a daily maximum of 19.7°, and a maximum wind gust of 37 km/h from the south at 5:21 pm. The observations at Laverton North Grassland were made under a clear sky, relatively cool temperatures and variably breezy conditions with some moderate winds from the south-west.

Discussion

The specimens differ somewhat from the description provided by Britton (1978 p. 22) in possessing rather bright reddish brown (rather than 'dark brown to black') elytra, and antennae of a similar but paler colour (rather than 'yellowish brown' with the lamellae 'very pale'). Additional colour images of a Laverton North specimen have been provided by Walker (2009).

A. carnei may be a species restricted to native grasslands and grassy woodlands. The grass species composition of the Canberra lawns from which it was collected in the past is not known, but many mown areas in Canberra currently retain native *Austrodanthonia* species and many are dominated by volunteer exotic grasses such as *Nassella neesiana*. Much of the lower lying parts of Canberra were originally covered with natural grasslands and significant remnants remain in Campbell and Yarralumla (Environment ACT 2005). The habitat at Yea, Victoria, is uncertain, but much of the Yea area was considered to be very open woodland (<5% tree cover) in 1982, consisting of improved and semi-improved pastures with smaller areas of native grasses (Paine 1982). Cherry and Allsopp (1991) demonstrated that *A. parvulus* has a distinct preference for clay and silt soils and this may also be the case with *A. carnei*.

The mass flight was observed c. 3 days after substantial rainfall, corresponding with activity records for other *Antitrogus* species. The flight period observed (c. 1 hr, in the afternoon) appears to be markedly different from that recorded for other species, daytime flight being unusual; however, observations concluded well before sunset, so flight activity may have continued through dusk. The rather striking red/black facies of the specimens is suggestive of aposematic colouration and might be indicative of a more diurnal activity pattern than is usual in the genus. The Laverton North flight extends the known adult activity period slightly: adults occurred 11 days earlier in the season than the Canberra specimen collected on 5 December 1972. Lack of defecation by the captive specimen for a period of 44 hours after collection adds further weight to the generalisation that adult *Antitrogus* do not feed.

It appears probable that the flying adults consisted only of males. Their apparent failure to land suggests that receptive females releasing pheromones were not present, or that conditions were otherwise unsuitable for pheromonal location. Perhaps activity in preceding days had resulted in the mating of most females and a cessation of their receptivity. Female *A. parvulus* prefer soils with moisture levels close to field capacity for oviposition (Logan 1997), so possibly the soils at the site had dried sufficiently to be no longer suitable for egg-laying and females were therefore unreceptive. Wind conditions may have affected male detection capabilities: Soo Hoo and Roberts (1965) found that steady breezes of c. 8-11 km/hr enabled male *Rhopaea magnicornis* to fly upwind to calling females, but that winds that were unsteady or of low speed prevented male orientation. Higher wind speeds and substantial gustiness at Laverton North may have had a similar detrimental impact. Alternatively, mating may occur at dusk or after dark.

The Laverton North Grassland suffered major degradation before reservation, losing a large proportion of its native forbs (Craigie 1993) and possibly therefore of its native insects. The presence of a population of this rare beetle in the reserve reinforces its continued high value in the conservation of grassland biota and will hopefully ensure the continued survival of the species in Victoria. The specimens have been deposited in the Museum of Victoria.

Acknowledgements

The work reported is part of a study funded by the Australian Government's 'Defeating the Weed Menace Programme' and supported by the Victorian Department of Primary Industries. Specimen collection was permitted under Department of Sustainability and Environment Research Permit No. 10004227. I thank Peter Allsopp for confirming the identity of the specimens and providing comments on the observations. Ken Walker (Museum Victoria) provided

the photograph, which is available along with other photographs of the species in the Pests and Diseases Image Library.

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Received 6 August 2009; accepted 10 September 2009

Silent lodgers and uninvited guests: arthropods found in a suburban house

We share our home with many different kinds of arthropods. The 'silent lodgers' (mostly spiders) generally live inside, while the 'uninvited guests' (mostly flies and moths) enter from time to time via the external doorways, and often end up as food for the lodgers.

When we moved in, silverfish, clothes moths and carpet beetles abounded. I did battle with them for a long time, with minimal effect. Then one day I saw a Daddy Long-legs spider feasting on a silverfish. From then on I let the Daddy Long-legs have the run of the house (well, up to a point). After a while it was extremely rare to see a silverfish, while the number of clothes moths was also greatly reduced. Once these prey had become scarce, I discovered that Daddy Long-legs also prey on other spiders, such as White-tailed spider, Black House spider, wrap-around spider (Fig. 1), young huntsman spiders, and even other Daddy Long-legs (Fig. 2). They in turn are preyed upon by spitting spiders (Fig. 3). Nothing seems to eat carpet beetles, however, and although we threw out the carpet more than 10 years ago, a few still remain.

White-tailed spiders put in an appearance during warm, dry weather, usually at night; Black House spiders, though present, are secretive and not often seen; tiny greyish brown spiders (*Oecobius* sp.) live on the cornice, windowsills and behind the skirting boards; and various species of jumping spiders manage to make a

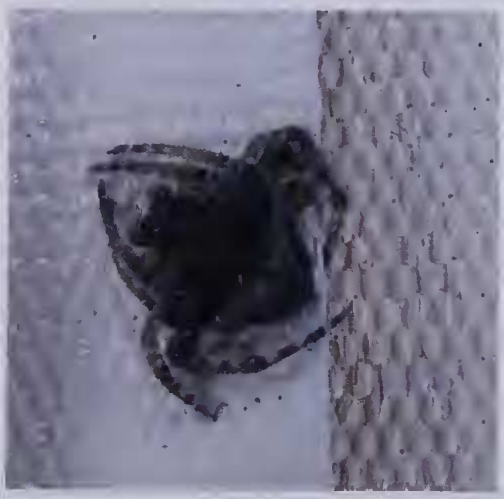

Fig. 1. Wrap-around spider.